III-V Microsystem Components for Positioning, Navigation and Timing in Extreme Harsh Environments

Completed Technology Project (2012 - 2015)

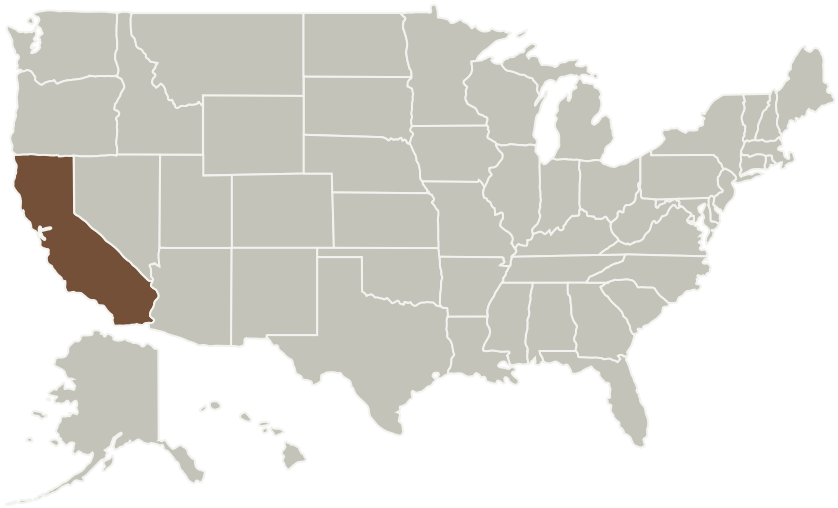
Project Introduction

Deep space missions of the future require precise positioning, navigation and timing (PNT) systems to advance capabilities of spacecrafts. This technology must be resistant to radiation exposure and extreme temperature excursions found in deep space environments. These operation requirements place new demands on the design of spaceborne components and instrumentation. Wide bandgap semiconductor materials (e.g. III-V nitrides) are inherently immune to harsh radiation environments and can operate under extreme temperatures (above 300oC). In addition, the use of these materials for component design eliminates the need for complex packaging (e.g. shielding) or cryogenic cooling leading to lightweight systems. In the this program, two types of microsystems components (resonators and sensors) that can withstand the harsh deep space environment will be developed to support NASA's future space missions. The research to be performed under this award aid in the realization of advanced components for timekeeping/frequency referencing as well as positioning and maneuvering. Ultimately, the III-V microsystems technology developed in this program can aid in precision landing, hazard avoidance, formation flying and autonomous docking.

Anticipated Benefits

The research to be performed under this award aid in the realization of advanced components for timekeeping/frequency referencing as well as positioning and maneuvering. Ultimately, the III-V microsystems technology developed in this program can aid in precision landing, hazard avoidance, formation flying and autonomous docking.

Primary U.S. Work Locations and Key Partners



Project Image III-V Microsystem Components for Positioning, Navigation and Timing in Extreme Harsh Environments

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Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Responsible Program:

Space Technology Research Grants

III-V Microsystem Components for Positioning, Navigation and Timing in Extreme Harsh Environments

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Primary U.S. Work Locations

California

Images

11479-1363186031712.jpg
Project Image III-V Microsystem Components for Positioning, Navigation and Timing in Extreme Harsh Environments
(https://techport.nasa.gov/image/1777)

Project Website:

https://www.nasa.gov/directorates/spacetech/home/index.html

Project Management

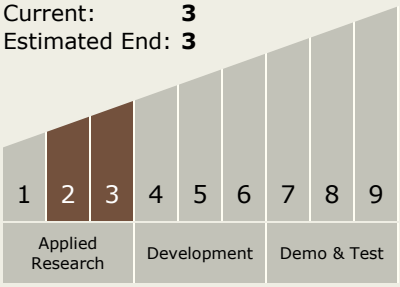
Program Director:
Claudia M Meyer

Program Manager:
Hung D Nguyen

Principal Investigator:
Debbie Senesky

Technology Maturity (TRL)

Start: **2**
Current: **3**
Estimated End: **3**



Technology Areas

Primary:

- TX17 Guidance, Navigation, and Control (GN&C)
  - TX17.2 Navigation Technologies
    - TX17.2.6 Rendezvous, Proximity Operations, and Capture Trajectory Design and Orbit Determination